MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

TES 3211 – EXPERT SYSTEMS

(All sections / Groups)

3 JUNE 2016
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **6 pages** only including the cover page.
2. Attempt **ALL** questions.
3. All questions carry equal marks and the distribution of the marks for each question is given.
4. Please print all your answers **CLEARLY** in the Answer Booklet provided.

Question 1 (2+2+2+4 marks)

(a) What are the two principle parts of an expert system?

(b) What is the difference between conventional programs and expert systems in terms of input characteristic?

(c) Give two IF-THEN type heuristic rules to score well in the expert system subject.

(d) Draw a figure to illustrate development of an expert system.

Continued .....

Question 2 (4+2+4 marks)

(a) Express the following statements in first-order predicate logic.
   i. Some questions are easy.
   ii. All horses are animal.
   iii. Mustang is a horse.
   iv. No failure is a success.

(b) Explain with an example one limitation of first-order predicate logic.

(c) Given the following two sentences.

   1. All men are mortal.
   2. Julian is a man.

   Prove that "Julian is mortal." by constructing resolution refutation tree.

Continued .....

Question 3 (4+2+4 marks)

(a) Give example with explanation for each of the following probability types.
   i. priori probability
   ii. posteriori probability
   iii. subjective probability

(b) What is the difference between conditional probabilities and Bayes' theorem?

(c) A screening test is a low-cost way of checking large groups of people for a disease. A more costly but accurate test shows that 1% of all people have the disease. The screening test indicates positive for the disease in 90% of those who have it, and in 20% of those who do not have the disease. What percent of people who test positive don't have the disease?

Hint: Bayes' theorem can be stated as below,

$$P(H|E) = \frac{P(E|H) \times P(H)}{P(E)}$$

Continued .....

Question 4 (4+2+4 marks)

(a) Translate the following statements into CLIPS code.

i. If a or b then x.
ii. If a and b then y.
iii. 5 + 8
iv. $(y2 - y1) \ / \ (x2 - x1) > 0$

(b) Define a deftemplate for facts containing information about a person. The deftemplate should include information about the name, the age, and the blood pressure numbers. Blood pressure is typically recorded as two numbers.

(c) Define a rectangle class in CLIPS and then create an instance for the rectangle class.

Continued .....

Question 5 (4+2+4 marks)

(a) Given two rules concluding the same hypothesis.

IF E1 AND E2 AND E3 THEN H (CF1 = 0.5)
IF E4 OR E5 THEN H (CF2 = 0.9)

where:

CF(E1,e) = 1, CF(E2,e) = 0.5, CF(E3,e) = 0.3,
CF(E4,e) = 0.7, CF(E5,e) = 0.2

Equation for calculating CFcombine,

$$\text{CFcombine}(CF1, CF2) = \begin{cases} CF1 + CF2(1 - CF1) & \text{both} > 0; \\ (CF1+CF2) / (1-\min(|CF1|,|CF2|)) & \text{one} < 0; \\ CF1 + CF2(1 + CF1) & \text{both} < 0. \end{cases}$$

Calculate CFcombine(CF1,CF2).

(b) Explain the meaning of the following evidential intervals.
i. [0, 1]
ii. [1, 1]

(c) Given numeric truth values,

x(A) = .2/6 + .6/7 + 1/8
x(B) = .1/6 + .7/7 + 1/8

calculate the fuzzy logic truth of the following:
i. NOT A
ii. A AND B
iii. A OR B
iv. A → B

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